

Total Ship Systems Engineering

Naval Postgraduate School
Monterey, CA

Professor Charles N. Calvano
TSSE Program Director



Total Ship Systems Engineering

Total Ship Systems Engineering (TSSE)

Program Objective

- ◆ Provide broad based, systems engineering and design oriented program....
- ◆ focusing on the warship as a total engineering system....
- ◆ including hull, mechanical, electrical (HM&E) and combat systems.

TSSE Faculty

- ♦ CHARLES N. CALVANO
– Professor Mech Eng/Sys Eng
TSSE Program Director &
TSSE Naval Engineering Chair
- ♦ ROBERT C. HARNEY
– Assoc. Prof. Sys Eng
TSSE Combat Systems Chair
- ♦ FOTIS A. PAPOULIAS
– Assoc. Prof. Mech Eng
HM&E Systems Integration
Naval Architecture
- ♦ ROBERT W. ASHTON
– Assoc. Prof. Electrical & Computer Eng
Shipboard Electrical Power
- ♦ JOHN M. GREEN
– Senior Lecturer, Systems Engineering Dept.
Combat Systems

Personal Background - Calvano

- ◆ U.S. Naval Academy, MIT (Course XIII-A)
- ◆ 28+ Years Navy Active Duty
- ◆ Command, Annapolis Lab of David Taylor Research Center
- ◆ Director Ship Design Group
- ◆ Director Advanced Technology Group
- ◆ Developed and Implemented NPS Total Ship Systems Engineering (TSSE) Program

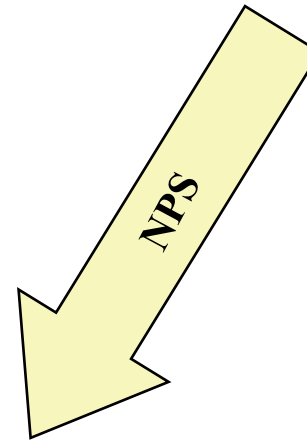
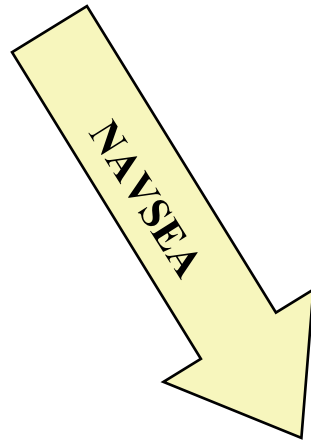
Personal Background – Harney

- ◆ B.S. Harvey Mudd College (Chemistry & Physics)
- ◆ Ph.D. UC Davis/Livermore (Applied Science)
- ◆ 11 years basic & applied weapons research at National Laboratories (Lawrence Livermore, M.I.T. Lincoln Lab)
- ◆ 11 years industrial R&D & management (Martin Marietta)
 - ◆ Corporation-wide technical resource in lasers, laser radar, optical countermeasures, electro-optical sensors, infrared missile seekers
 - ◆ Manager, Laser Systems Engineering
 - ◆ Technical Director, Air Defense Advanced Programs
 - ◆ Developed, taught Sys Eng'g program at Martin Marietta
- ◆ 2 years independent consulting
- ◆ Joined NPS in 1995 as Associate Professor of Physics

Background

Systems approach to HM&E and
Combat Systems integration
needed.

Academia needs increased
systems content, revitalized
design experience in engineering
curricula.



TSSE Program Established

Student Input

Students eligible for inclusion in the program:

Navy Specialty Area

Naval Engineering

Electrical Engineering

Combat Systems

Degree Area

Mechanical Engineering

Electrical Engineering

Applied Physics

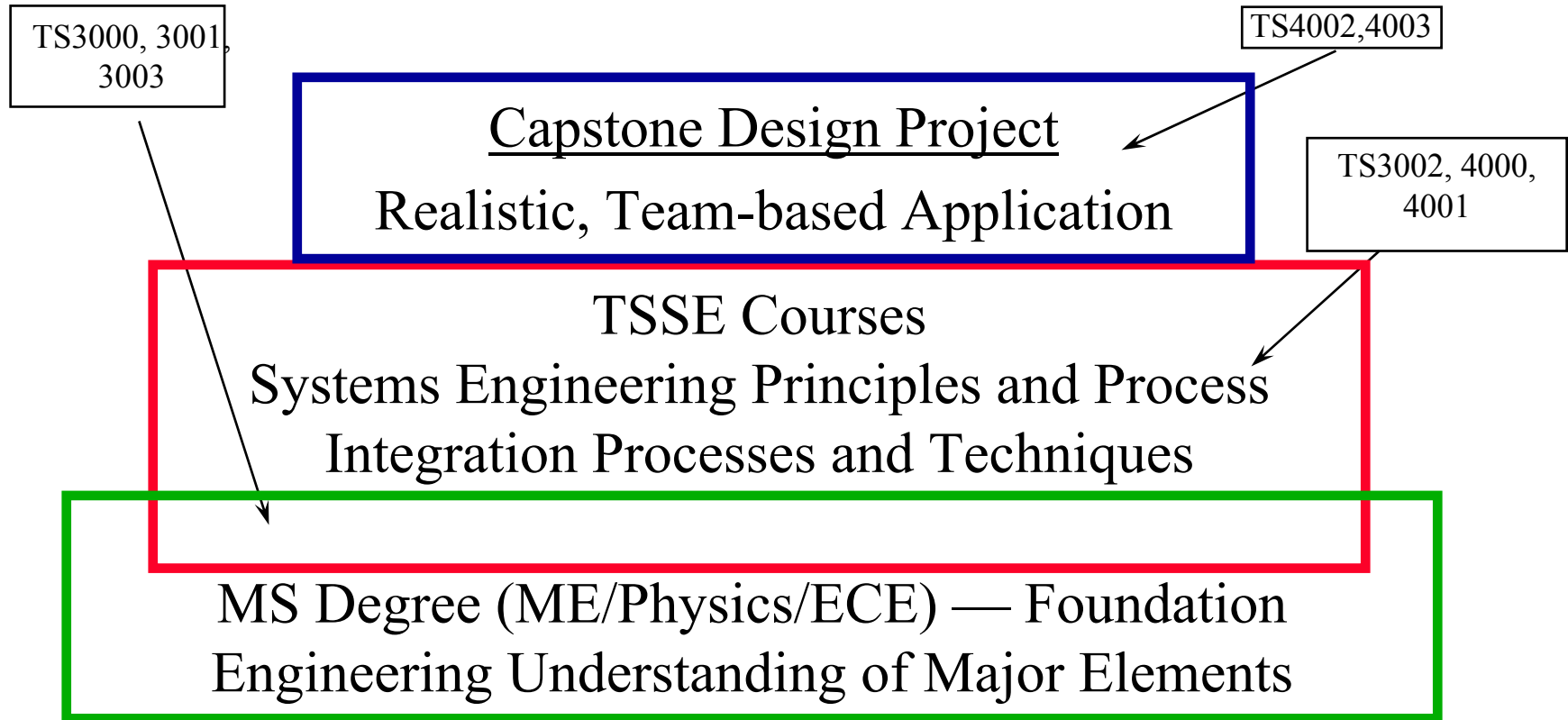
An INTER-DISCIPLINARY Program

Program Content

In addition to other degree requirements, including thesis, the TSSE students take the following eight core courses, which are “the program”.

- TS3000 Shipboard Electrical Power Systems
 - TS3001 Fundamental Principles of Naval Architecture
 - TS3002 Principles of Ship Design and Systems Engineering
 - TS3003 Naval Combat Systems Elements
 - TS4000 Naval Combat Systems Engineering
 - TS4001 Design of Naval Engineering Systems
 - TS4002 Ship Systems Integration
 - TS4003 Total Ship Systems Engineering
- } Capstone Design Project

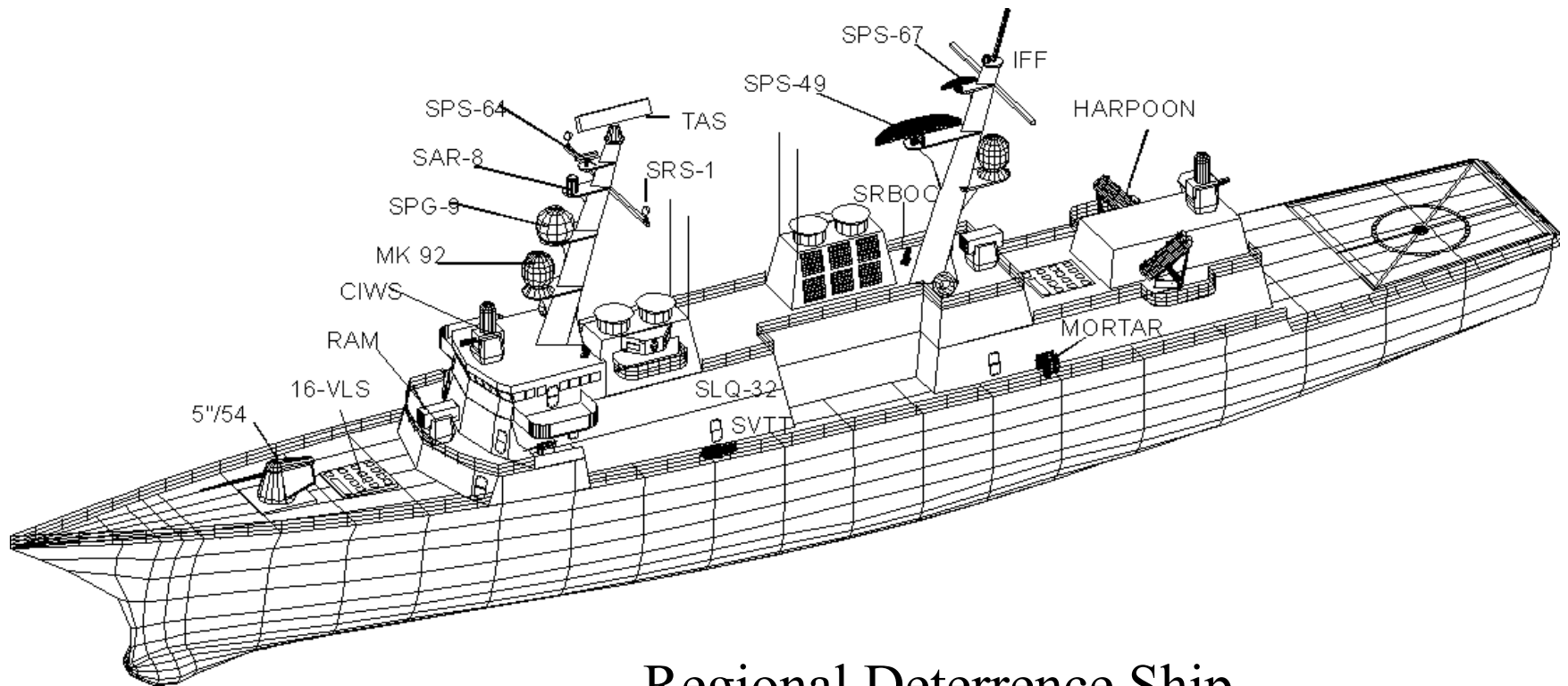
TSSE Knowledge Scheme



TSSE- Design History

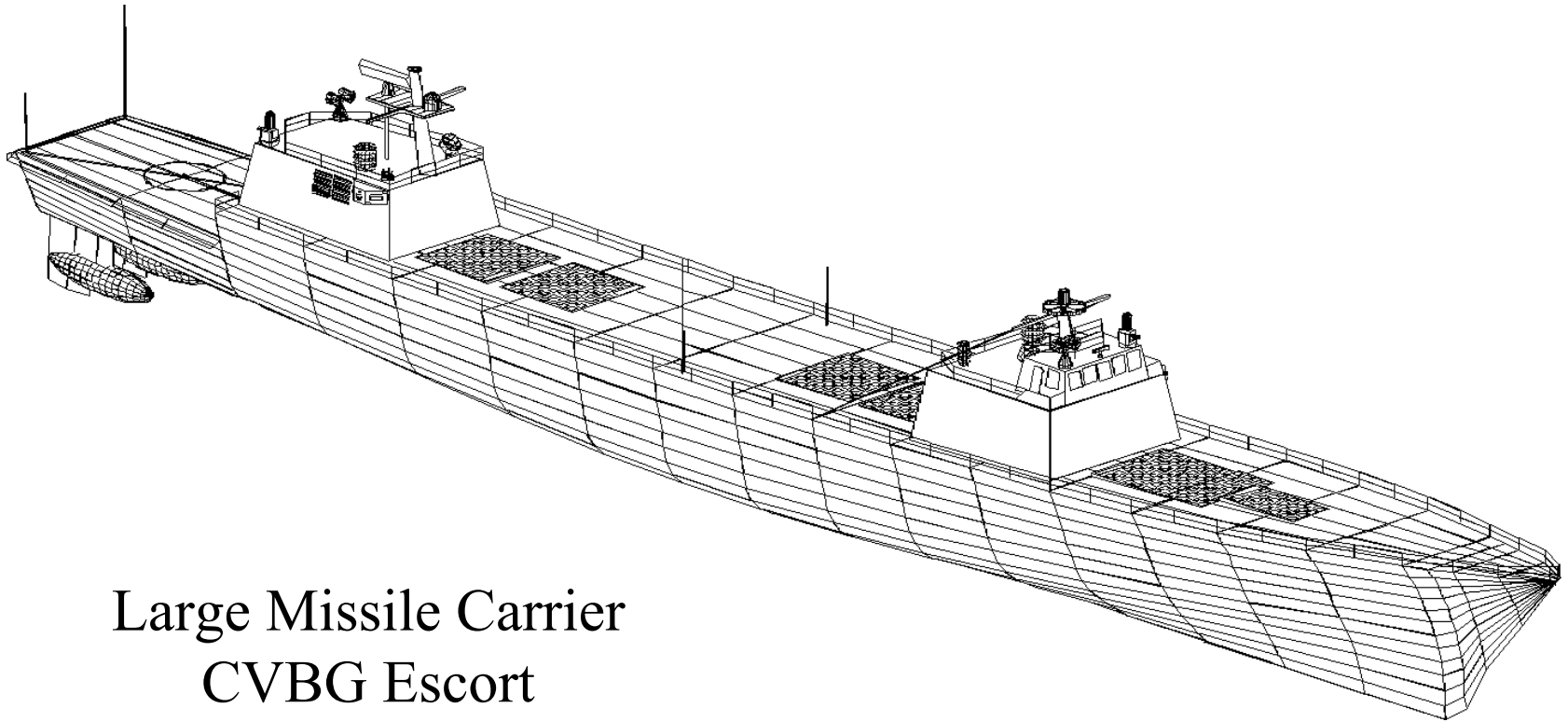
<u>TEAM</u>	<u>DESIGN PROJECT</u>	<u>TEAM COMPOSITION</u>
1992	Regional Deterrence Ship	4 USN
1993	Large Missile Carrier ("Arsenal" Ship)	5 USN
1994	Littoral Warfare "Mother Ship"	6 USN
1995	Combined (USN/USCG) Patrol Corvette	5 USN, 3 USCG
1996	Arsenal Ship	10 USN, 4 USCG, 1 USMC
1997	S-CVX	6 USN, 1 CIV
1998	MPF Ships for 2010	6 USN
1999	Surf. Warfare Test Ship	4 USN, 1 Greece
2000	Small Fast Networked combatant	6 USN, 1 Chile, 1 Turkey
2002	SEA ARCHER	7 USN, 2 Turkey, 1 Greece, 1 Sing. Civ
2003	SeaBase Ship	5 USN, 1 USCG, 2 Sing, 2Turk, 1 Tun

1992 Student Design



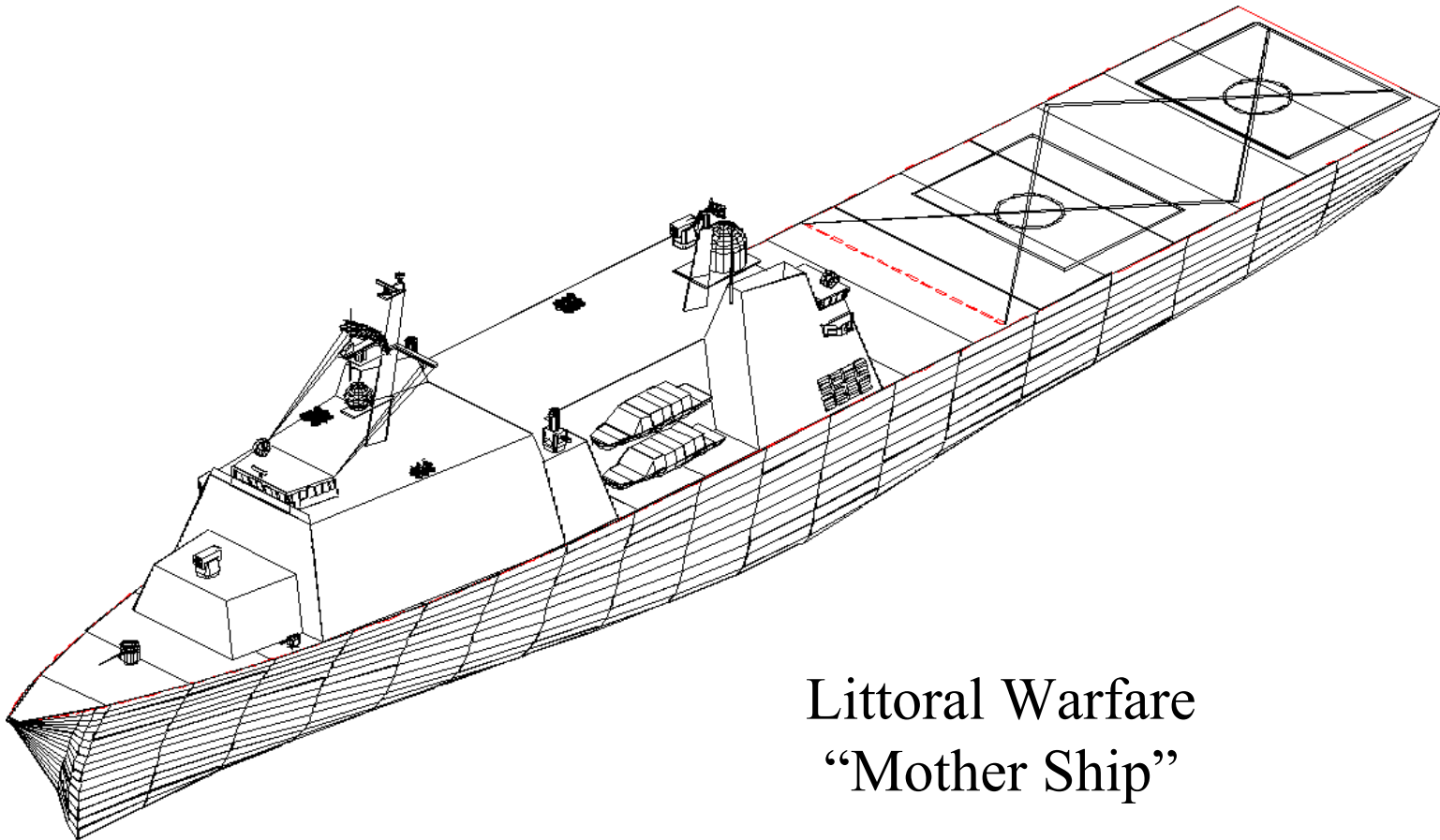
Regional Deterrence Ship

1993 Student Design



Large Missile Carrier
CVBG Escort
("Arsenal Ship")

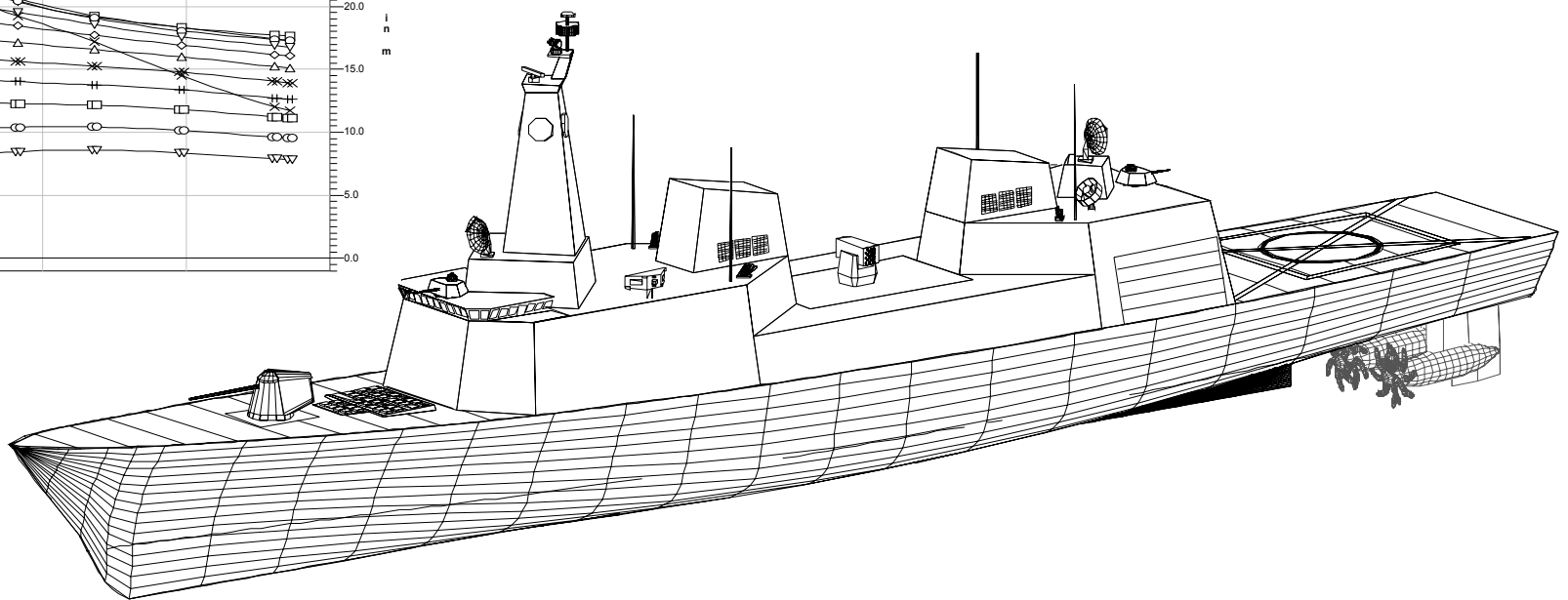
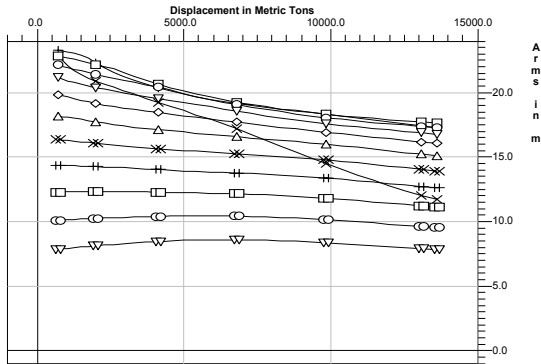
1994 Student Design



Littoral Warfare
“Mother Ship”

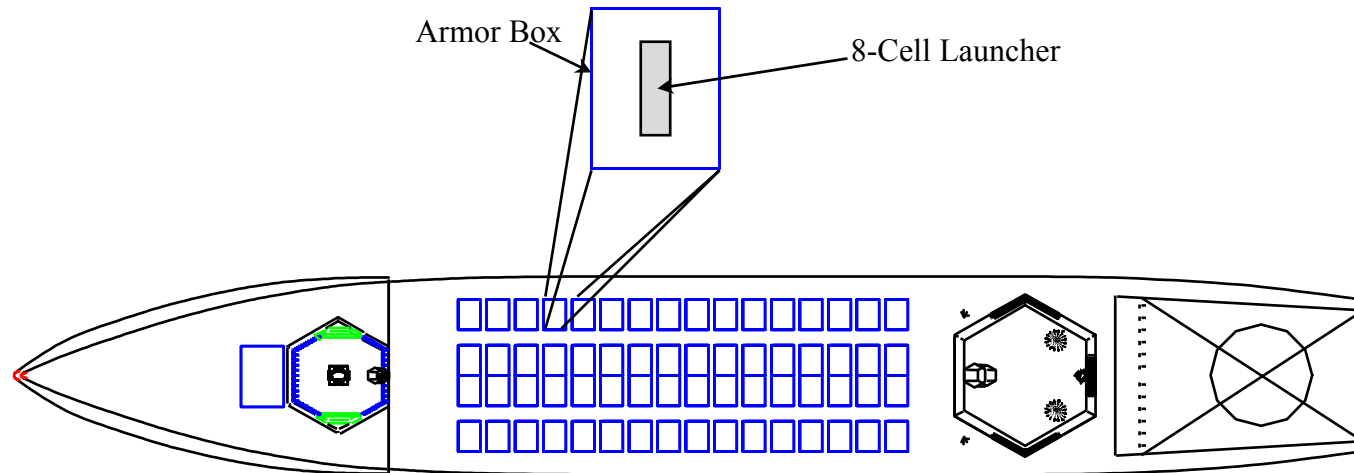
1995 Student Design

Cross Curves of Stability



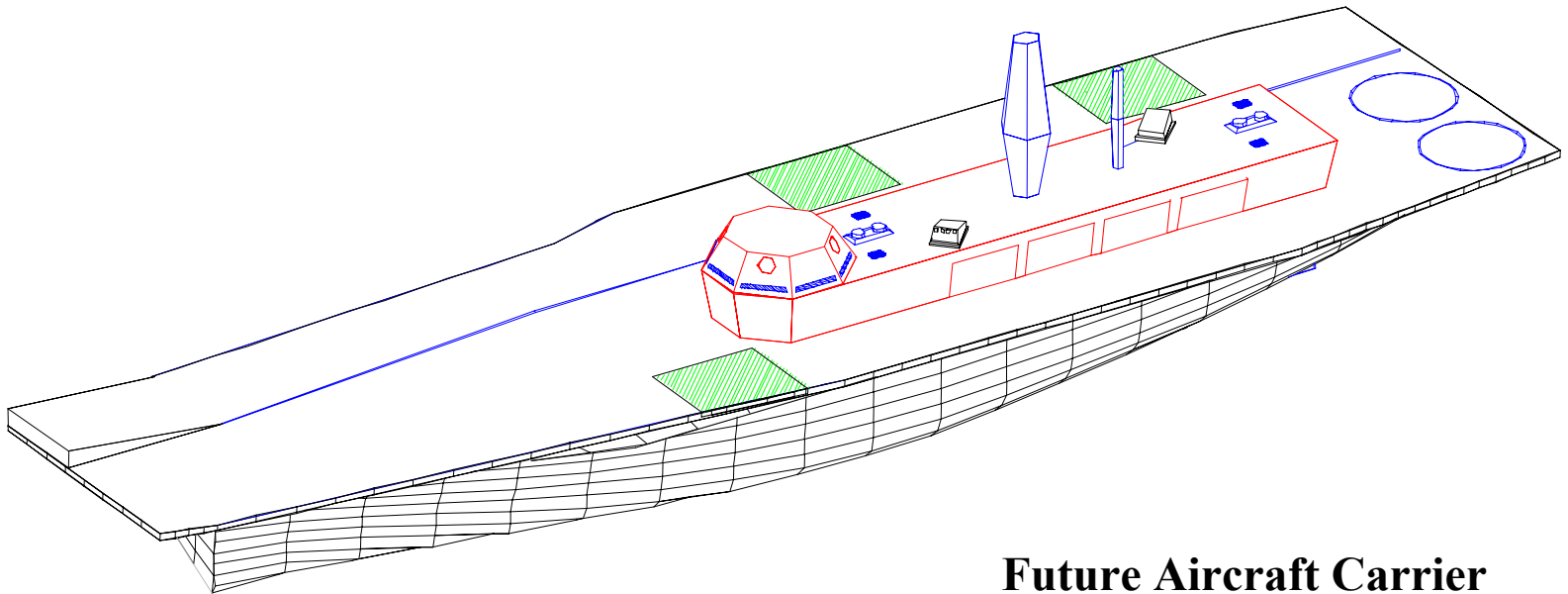
Combined Patrol Corvette

1996 Student Design



Arsenal Ship

1997 Student Design



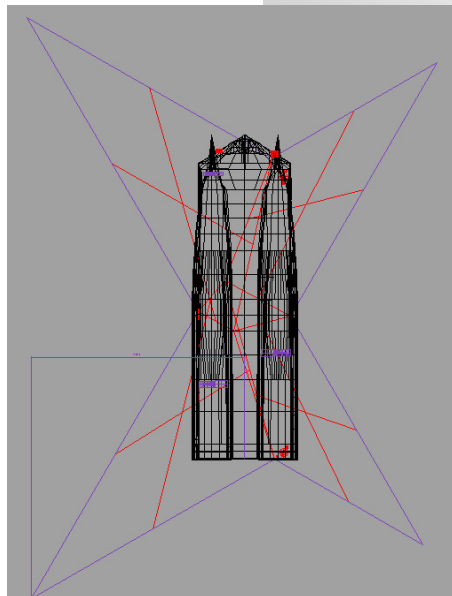
Future Aircraft Carrier

1998 Student Design

Maritime Preposition
Ship for 2010

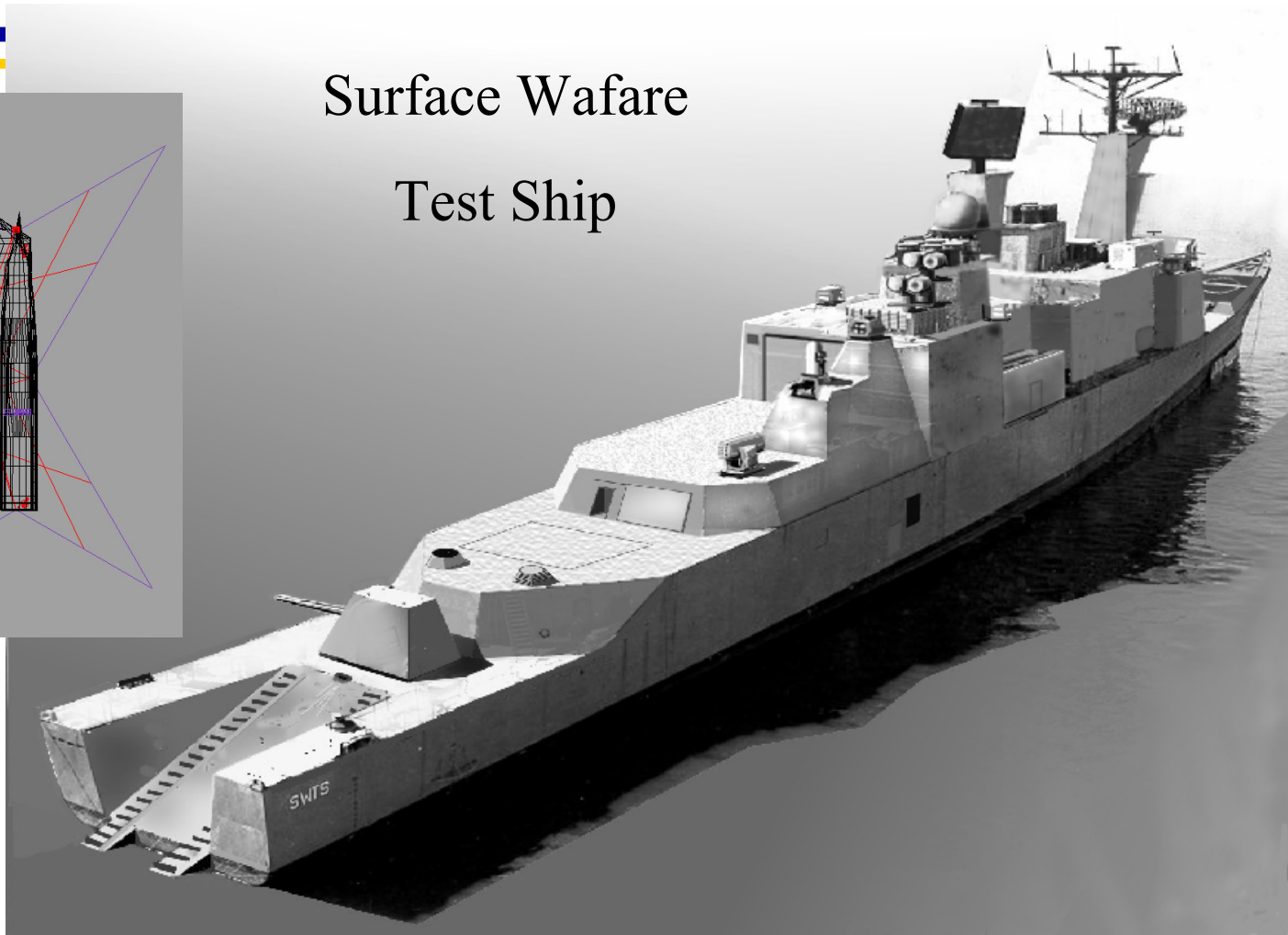


1999 Student Design



Surface Warfare

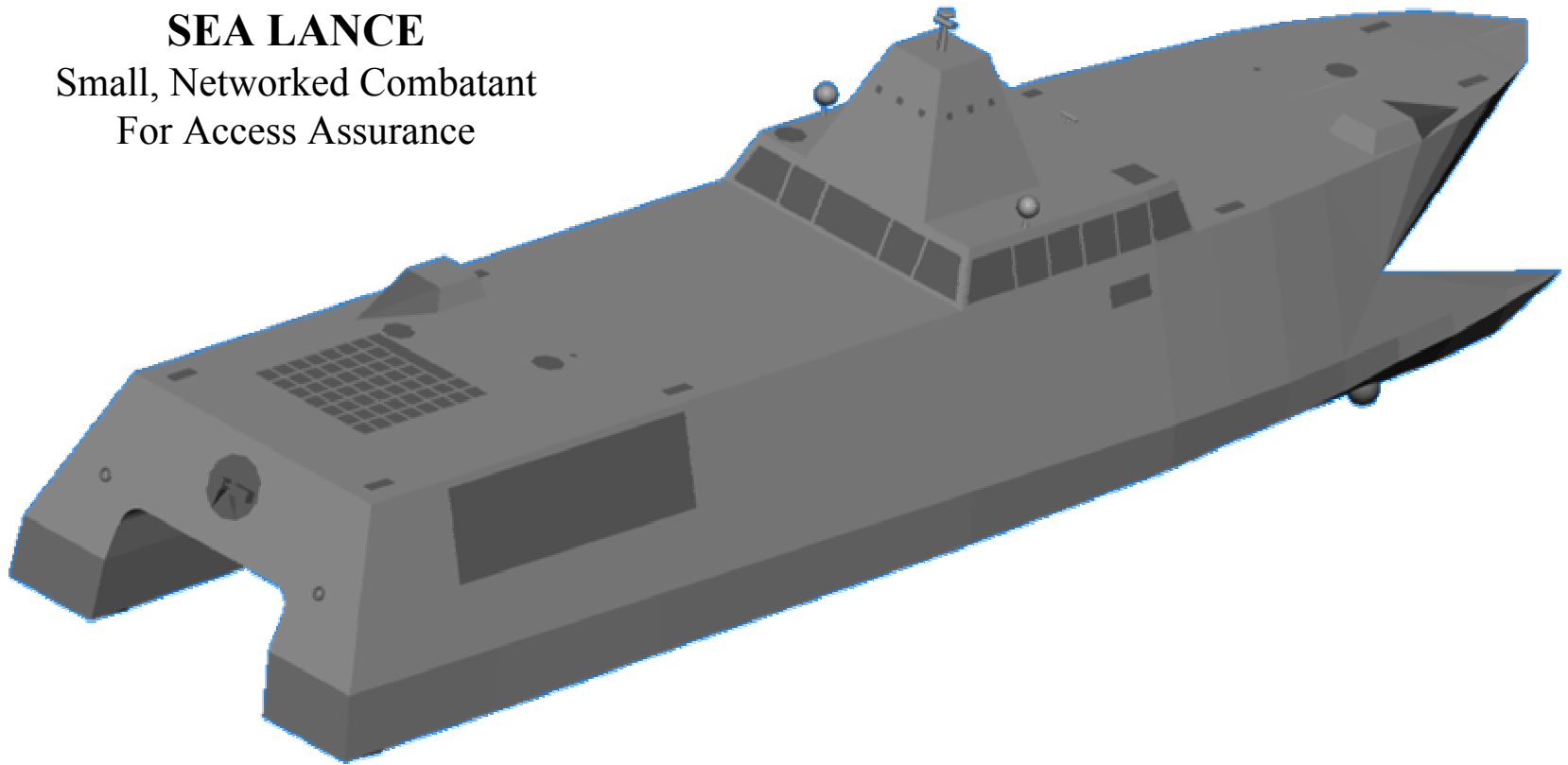
Test Ship



2000 Student Design

SEA LANCE

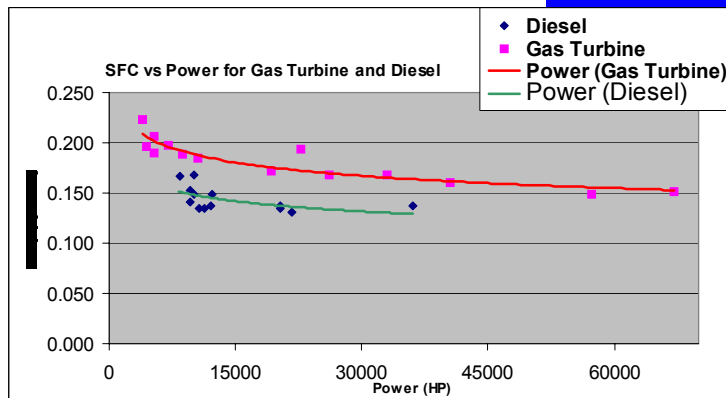
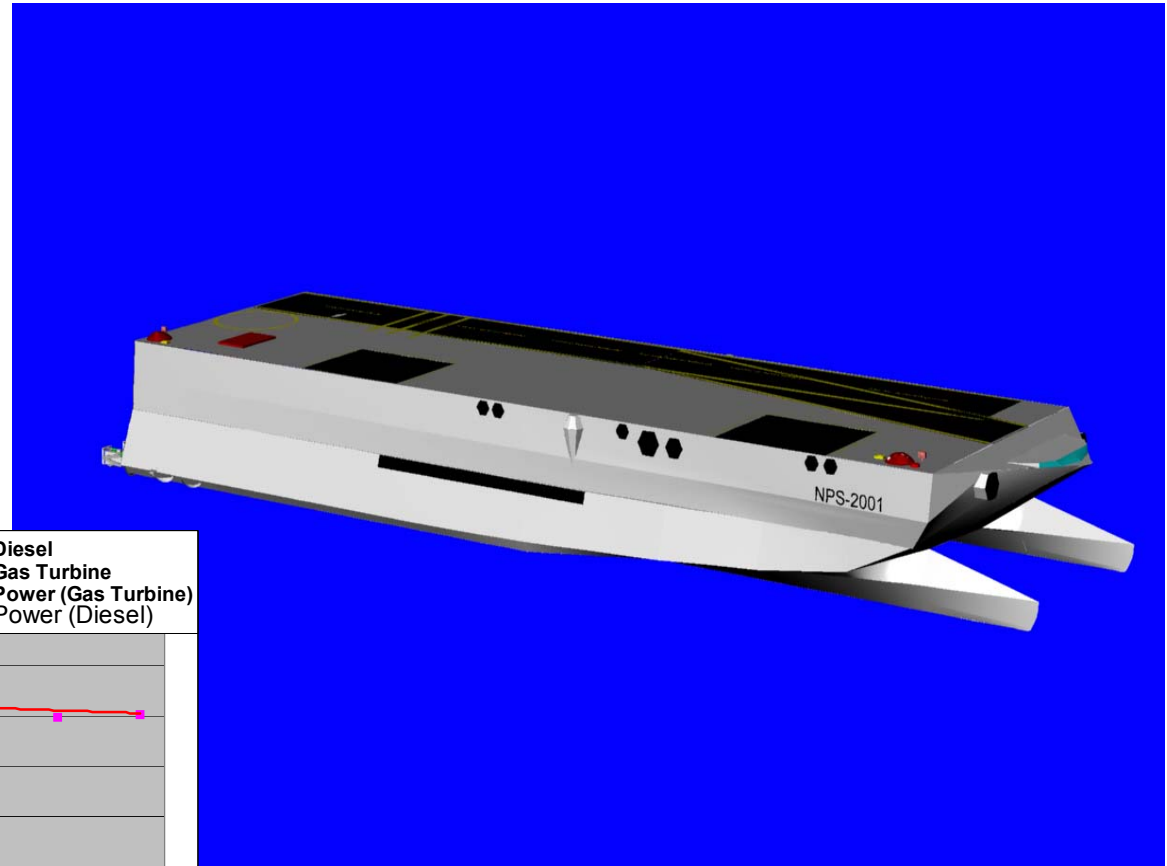
Small, Networked Combatant
For Access Assurance



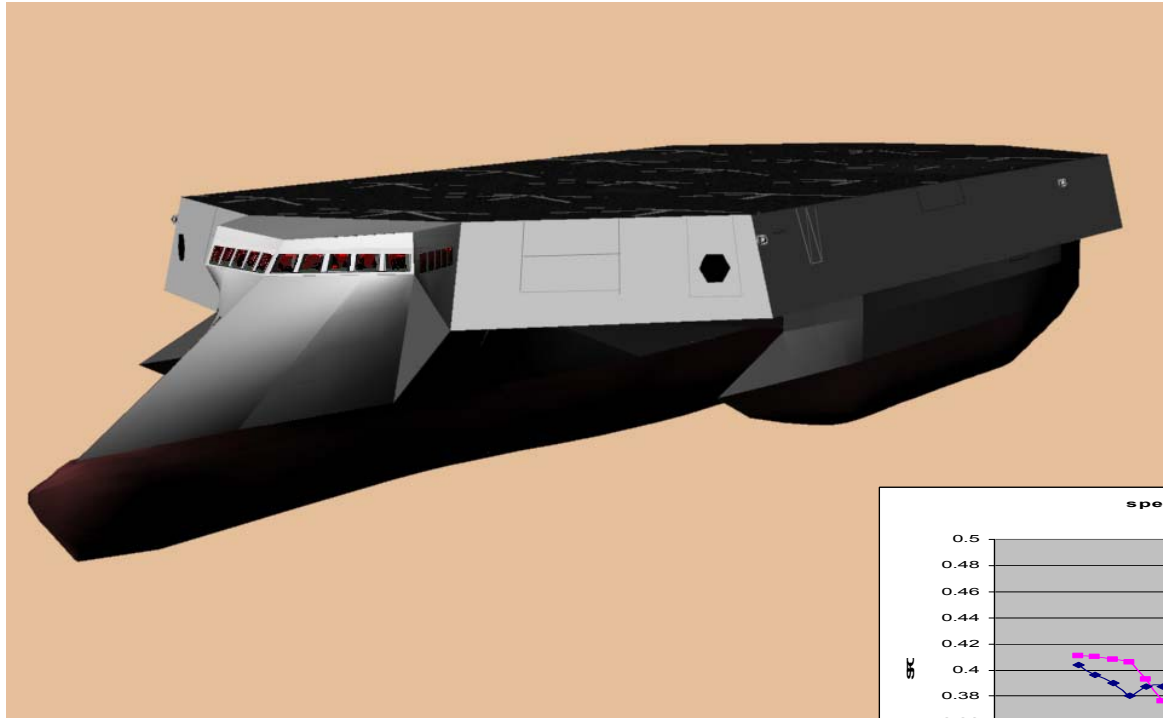
2001 Student Design

SEA ARCHER:

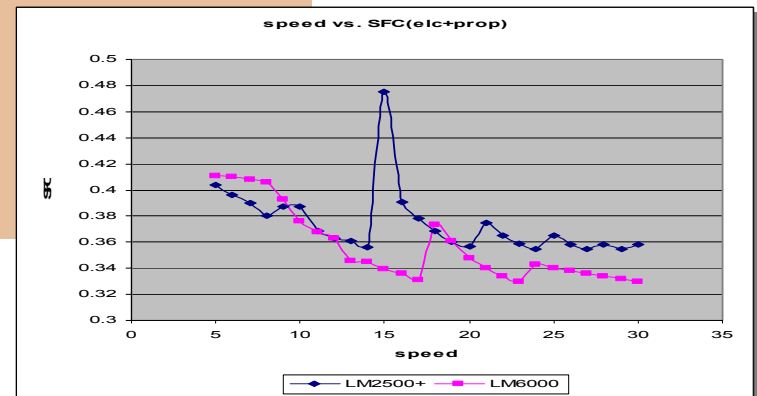
Unmanned Air Vehicle
Platform



2002 Student Design



SEA FORCE:
A Sea Basing Platform



A vision of the future of TSSE at NPS

- ◆ Develop inter-departmental ties, mirror real world processes
 - NPS is microcosm of Navy/DOD
 - Ops Research: MOE development & application
 - Institute for Joint Warfare Analysis Ties
 - Closer Ties to NAVSEA “Spring Styles” efforts
- ◆ Attract DOD/DON civilians
- ◆ Increased URL participation
- ◆ Increased International Officer participation

The Payoff

